

SALMONELLA SPECIES

Funding for this publication was made possible in part by the Food & Drug Administration grant PAR-16-137.
 The views expressed do not necessarily reflect the official policies of the Department of Health & Human Services.

BIOLOGY

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Organism: *Salmonella* species (spp.) are mobile bacteria with over 2,500 different strains. Two strains cause typhoid fever, and many other cause non-typhoidal salmonellosis.

Conditions for Survival: Can tolerate 46 - 113°F, with maximum salt of 8%. *Salmonella* spp. can function from normal to nearly no oxygen levels. They survive well in low moisture foods, but are sensitive to moderate heat. They aren't able to break down plant cell walls, but grow and replicate rapidly when cuts or tissue damage provides them with nutrients.

Important Reservoirs: *Salmonella* spp. can be found in human, animal, and plant tissue. Can be found in the guts and feces of vertebrate animals (especially in birds, poultry, swine, turtles, & reptiles), in pond water sediment, in water, soil, insects, and on equipment.

ILLNESS

Onset: Illness begins 12-72 hours after consumption.

Symptoms: Nausea, vomiting, abdominal cramps, diarrhea. Sometimes also fever, chills, headache. Most people recover with from non-typhoidal salmonellosis no treatment.

Duration: 4-7 days, with acute symptoms for 1-2 days or longer.

Complications: Dehydration and electrolyte imbalances in severe cases can lead to death. Autoimmune response can cause reactive arthritis response 3-4 weeks after infection. Can also escape gastrointestinal tract and cause septicemia and bacteremia.

Special Risks: The very young, elderly, and immunocompromised are at higher risk of dehydration and electrolyte imbalances, which can cause death if not treated properly. People living with HIV get salmonellosis up to 20x more often than other groups.

Hospitalizations: Can be up to 27% in produce-related outbreaks.

Mortality Rate: ~1% for non-typhoidal salmonellosis; goes up to 3.6% in hospital and nursing home settings. Typhoidal mortality is ~1% if treated, but up to 10% if untreated.

FOODS

Common foods associated with outbreaks:

Raw meat, poultry, seafood, eggs, dairy product, sauces, cake mixes, confectionary.

***Salmonella* is the pathogen most frequently associated with fruit & vegetable crop foodborne illness outbreaks.**

~1,000,000

CASES / YEAR

(NON-TYPHOIDAL SALMONELLA ONLY)



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PRODUCE FARMS

Areas of Concern: *Salmonella* spp. are carried by a wide variety of vertebrate animals and are often found in contaminated water sources. Because of this we are particularly concerned about **domestic and wild animals** activities (**especially birds**), **animal-based soil inputs, water quality, sanitation, and worker hygiene**.

Salmonella spp. are adapted to adhere to many surfaces. They've been shown to use biofilms to enhance their attachment to vegetal surfaces. Their growth rate skyrockets once tissue is cut or damaged, providing nutrients they need to grow and replicate.

CASE STUDY

2002 & 2005 *Salmonella* spp Outbreak in Tomatoes: 26 states, 510 cases in 2002, 16 states, 72 cases in 2005. Median age 29.

Traceback: New Hampshire reported the first cluster of salmonellosis cases in 2005, triggering CDC investigation into what became a multi-state outbreak. Traceback investigations started with uncooked tomatoes cut and served in restaurants, moved to distributors, and used tomato case information to identify a farm on the eastern shore of Virginia as the source.

Findings: Water in the farm's irrigation pond tested positive for the outbreak strain of *Salmonella*. Pond water was applied to the soil bed, but *Salmonella* can move through plant tissue to other plant parts. In 2006 during follow up visits, wild geese were observed in the irrigation pond. Some counties in the area reported elevated cases of salmonellosis from 1968-1998, suggesting there may be seasonal environmental factors at play in the region.

CONTROLS

- Know your water quality before applying it to produce or food contact surfaces.
- Separate animals and their manures from produce as much as possible.
- Scout your produce handling areas for birds roosting or nesting.
- Clean tools and food contact surfaces when they may be contaminated.
- Emphasize good worker hygiene, including hand-washing and clean clothes.

LINKS

Outbreak investigations for tomatoes & melons: <https://bit.ly/3sfo0lg>, <http://bit.ly/3nud13K>
***Salmonella*'s interactions with plants & animals:** <http://bit.ly/3i2e5La>
FDA Bad Bug Book profiling pathogens: <https://bit.ly/2XuhEAi>